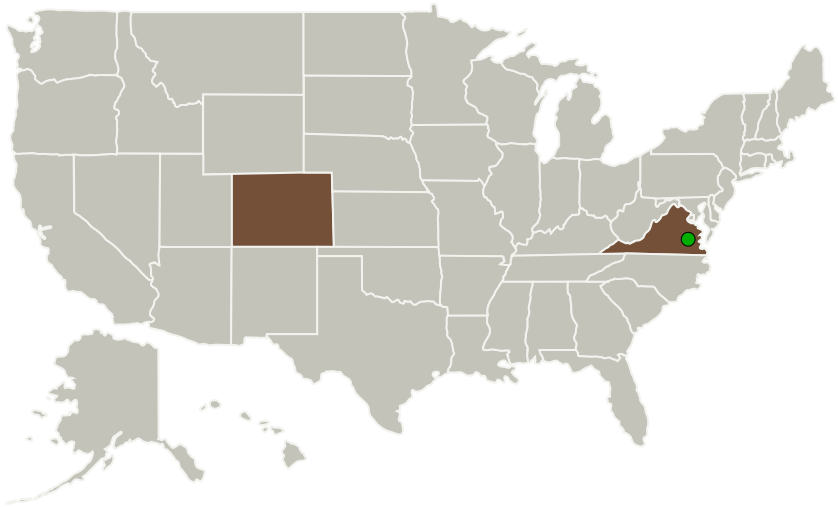
Deployable Structural Booms for Large Deployable Solar Arrays, Phase I

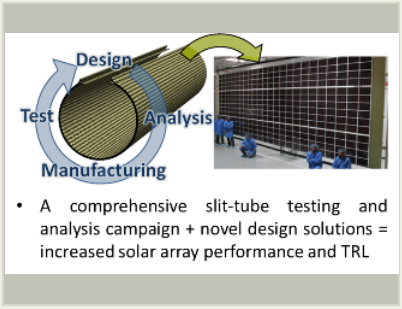
Completed Technology Project (2014 - 2014)

Project Introduction

The development of a new generation of large, high power deployable solar arrays has been identified as the most significant challenge facing the development of solar electric propulsion (SEP) systems. In response, innovative solar array structural concepts have been proposed including flexible thin-film solar arrays which roll like a carpet for stowage. These systems are simple and reliable while also exhibiting high performance. Rollable solar arrays have not yet reached a high enough technology readiness level (TRL) to be utilized as the primary solar array in a high-stakes mission. The TRL of the current rollable solar array systems is hindered by their reliance on a particular manifestation of deployable slit-tubes which utilizes an open and unsupported slit and high-performance fiber-reinforced polymer (FRP) composite materials. The FRP slit tubes are high performance and ideally suited to the ROSA system, but do not have sufficient test-heritage or widely accepted engineering tools to enable reliable and efficient structural predictions such as buckling strength or design optimization studies. A slit-tube optimization loop including comprehensive testing and analysis as well as the evaluation of novel design features and manufacturing methods is proposed to improve roll out solar array technologies being considered for SEP. The proposed technology will result in a library of slit-tube test data with analytical correlation, will increase the deployed strength over the state of the art by 4X and increase the state of the art TRL.

Primary U.S. Work Locations and Key Partners





Deployable Structural Booms for Large Deployable Solar Arrays Project Image

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Organizations Performing Work	Role	Type	Location
Roccor, LLC	Lead Organization	Industry	Longmont, Colorado
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

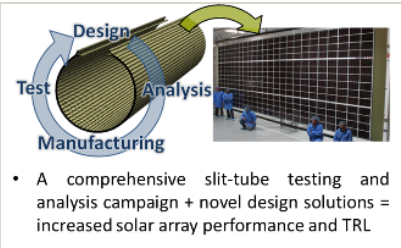
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137694)*

Images



Project Image
Deployable Structural Booms for Large Deployable Solar Arrays Project Image
(https://techport.nasa.gov/image/127775)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Roccor, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

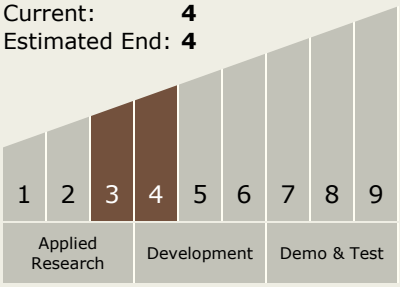
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
William Francis

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.1 Lightweight Concepts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System